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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/040,772	01/04/2002	Fred Chen	42390P11369	2169
8791	7590	05/18/2004	EXAMINER	
BLAKELY SOKOLOFF TAYLOR & ZAFMAN 12400 WILSHIRE BOULEVARD, SEVENTH FLOOR LOS ANGELES, CA 90025			ROSASCO, STEPHEN D	
			ART UNIT	PAPER NUMBER
			1756	

DATE MAILED: 05/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/040,772

Applicant(s)

CHEN ET AL.

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 1 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11, 18-20 and 25-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11, 18-20 and 25-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

In response to the Amendment of 4/23/04, wherein claims 25-30 were added, the examiner repeats the prior office action rejection and includes a rejection under 35 U.S.C. 112. the action is not made final.

(IDS) The applicant requested that page 5 of the submitted IDS be initialed and signed. However, the PTO1449 has the US Patent Serial Nos. in the date column and not the patent column. Please correct the 1449 form and resubmit page 5, with the next office action and I will initial and sign the form. The examiner has already considered the references.

Claims 18, 19 and 25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 18 and 19 as it refers back to claim 18, is very difficult to follow, with respect to beginning the claim with the phrase "a second mask", and then first and second patterns. The phrase "modifying radiation" is also ambiguous in that it is unclear from the claim how this radiation reduces "a proximity effect distortion".

In claim 19, which reads "the mask of claim 18" it is unclear which mask is being referred to in claim 18.

Claim 25, the word "distortion" does not occur in the specification and so is not defined. The meaning of the phrase "pattern corresponding to the first pattern" is unclear. The specifics of the pattern that is the distortion reducing pattern is unclear, and how it corresponds to the "first pattern" is unclear.

REMARKS :

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Claims 1-11, 18-20 and 25-30 the applicant argues that the prior art to Cirelli does not teach or reasonably suggest transmitting radiation to a radiation sensitive layer that has already been exposed to radiation.

However, the independent claims 1, 18 and 25 do not recite anything about a double exposure prior to development. The independent claims are written broadly and recite simply a mask comprising a pattern to modify a circuitry feature, by transmitting modifying radiation according to the pattern to a region of the radiation sensitive layer containing the circuitry feature to reduce a distortion of the circuitry feature. The use of the terms "modifying" and "reduce distortion" are general enough that one would expect that most radiation is for the purpose of modifying some aspect of a photoresist layer and that the resulting layer will have less distortion than before exposure. A reading of the specification is not sufficient to read the limitations into the claims as argued by the applicant. Therefore, the examiner repeats the rejections here.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-11, 18-20 and 25-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Cirelli et al. (6,218,057).

The claimed invention is directed to a first and a second mask. The second mask having a second pattern that corresponds to a first pattern of a first mask, the first pattern to expose an exposure feature in a radiation sensitive layer, the second pattern comprising a

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transparent portion to reduce a proximity effect distortion of the exposure feature by providing modifying radiation to a region of the radiation sensitive layer that contains the exposure feature.

Rather than the second mask 730 having a passive pattern to merely protect the previously exposed first circuitry pattern and trim or eliminate a false edge outside of a circuit feature region without modifying the circuit feature, the second mask 730 may have an active pattern 740 to play in modifying, reshaping, or resizing the circuitry feature.

Advantageously, in this way the first mask 710 and the pattern 720 are not solely responsible for defining the size and/or the shape of a circuitry feature, and the second mask 730 and the modifying pattern 740 may assume some of the workload for defining the size and/or the shape of the circuitry feature.

Cirelli et al. teach a process for fabricating a semiconductor device comprising: directing radiation of a certain wavelength onto a mask having a first pattern therein;

projecting an image of the first pattern into a layer of energy sensitive material formed on a substrate;

developing the image to form the first pattern in the energy sensitive material;

forming a layer of energy sensitive resist material over the first pattern;

directing radiation of a certain wavelength onto a mask having a second

pattern therein wherein the wavelength is either the same or different than the wavelength of the radiation directed onto the mask having the first pattern;

projecting an image of the second pattern into the layer of energy sensitive resist material wherein the image is aligned with the underlying first pattern so that the first pattern and the second pattern cooperate to define a desired pattern;

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developing the image to form the second pattern in the energy sensitive material; and developing the desired pattern from the first and second pattern, wherein the desired pattern has a dimension that is smaller than at least one of the wavelengths of radiation.

Cirelli et al. also teach (col. 6, line 60+) contact holes are produced by creating a first intermediate pattern that is a rectangle or square, and the pattern that results from an image with square corners has corners that are somewhat rounded. After the first pattern with rounded corners is developed, a layer of energy sensitive material is formed over the pattern and the image of a second square or rectangle is formed therein. The image of the second square or rectangle is positioned such that one corner overlaps one corner of the underlying pattern with rounded corners.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-11, 18-20 and 25-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (6,544,695) or Capodieci (6,044,007) or Inoue et al. (6,110,647).

The claimed invention is as stated above.

Wang et al. teach a photomask set, each photomask having a different pattern thereon so that a resulting pattern is formed on a photoresist layer after photo-exposures using each of the photomasks are carried out, wherein the resulting pattern on the photoresist layer has different pitch-to-size ratios and a pitch-to-size ratio of the pattern on each photomask is greater than at least one of the pitch-to-size ratios of the resulting pattern.

And wherein the photomask set includes a plurality of optical proximity correction masks, which includes serif patches.

Capodieci 19. A data storage medium containing mask layout data including optical proximity correction for use in writing a mask, includes a first mask data portion which corresponds to a feature having an interior corner. The first mask data portion corresponding to the interior corner includes a multi-level or stepped inner serif in the interior corner which provides for improved writeability of OPC independent of process push or bias. Alternatively, the data storage medium contains mask layout data, which includes a second mask data portion. The second mask data portion corresponds to a feature having an exterior corner and includes a multi-level or stepped outer serif on the exterior corner. The stepped outer serif also provides for improved writeability of OPC independent of process push or bias.

Inoue et al. teach a method of manufacturing a semiconductor device, comprises the steps of forming a first transfer pattern corresponding to a mask pattern on a major surface side of a semiconductor substrate through a first mask plate on which the first mask pattern having a straight portion and a bent portion is formed, and forming a second transfer pattern corresponding to a second mask pattern on a major surface side of the semiconductor substrate through a second mask plate on which the second mask pattern having a pattern arranged at a position corresponding to the straight portion is formed.

Inoue et al. also teach as shown in FIG. 6A (design pattern), a pattern is transferred onto a wafer in a state wherein the offset between the hole patterns 14 is corrected as shown in FIG. 6B (transfer pattern on the wafer) by correcting the position of the hole pattern at the corner

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portion of the pattern 11 in advance from the hole pattern 12a into the hole pattern 12, even when the corner of the pattern 13 is rounded by the optical proximity effect.

The teachings of the cited references differ from those of the applicant in that the applicant teaches specific examples in the independent claims of applying the general two mask method, such as line edge position of phase shifters, or in general where OPC is a factor. However, the specific mask features and the problems with them are all well known in the art. Therefore, it would have been obvious to one having ordinary skill in the art to take the teachings of the cited references and apply them to the typical problems with regard to image formation that is affected by OPC in order to make the claimed invention because the applicant is citing the typical problems that are encountered in the photolithography art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Rosasco whose telephone number is 571-272-1389. The examiner can normally be reached on M-F from 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff, can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

For general Information call (571-272-1700).

A handwritten signature in black ink, appearing to read "S. Rosasco", with a stylized, cursive script.

S. Rosasco
Primary Examiner
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S. Rosasco
5/12/04